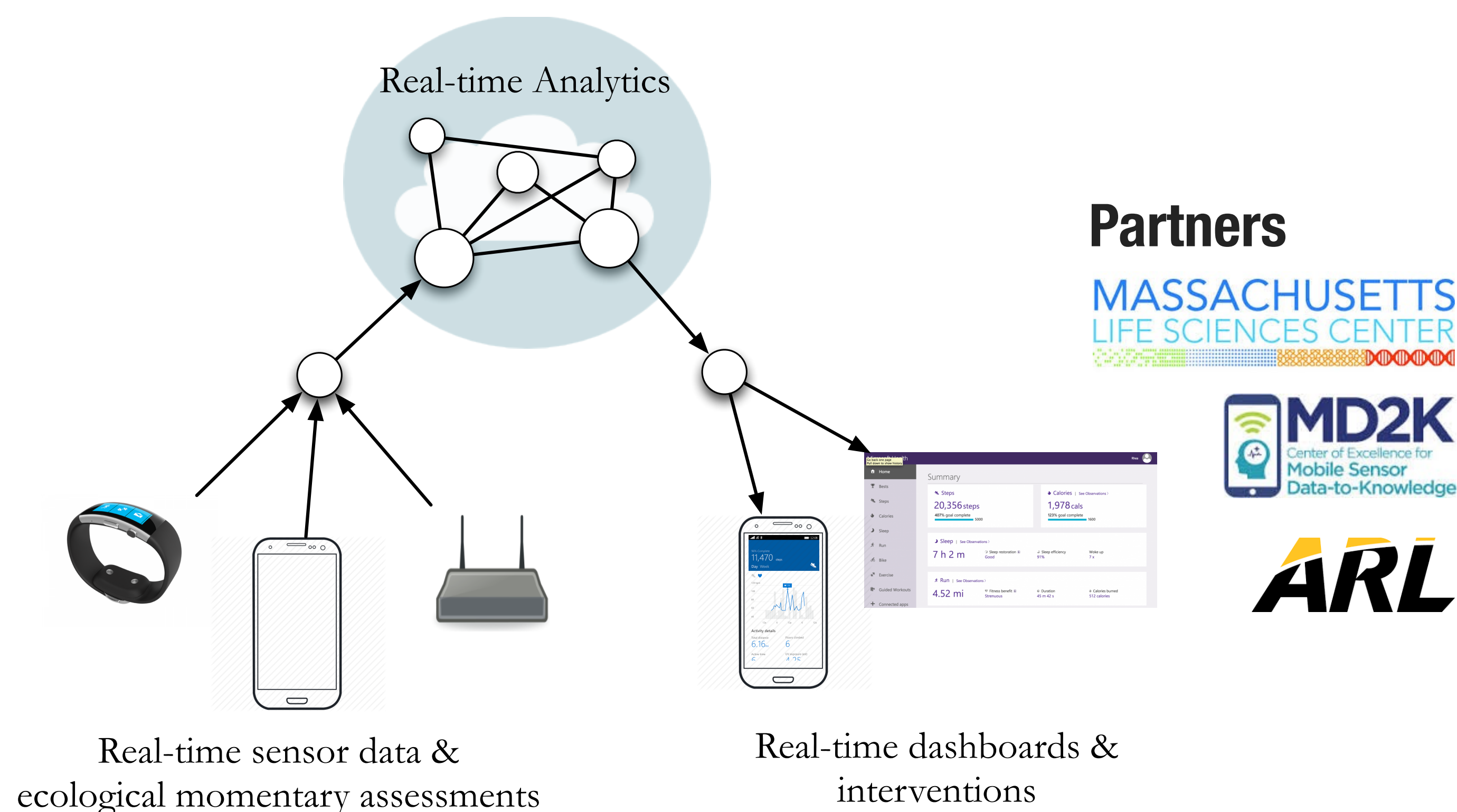
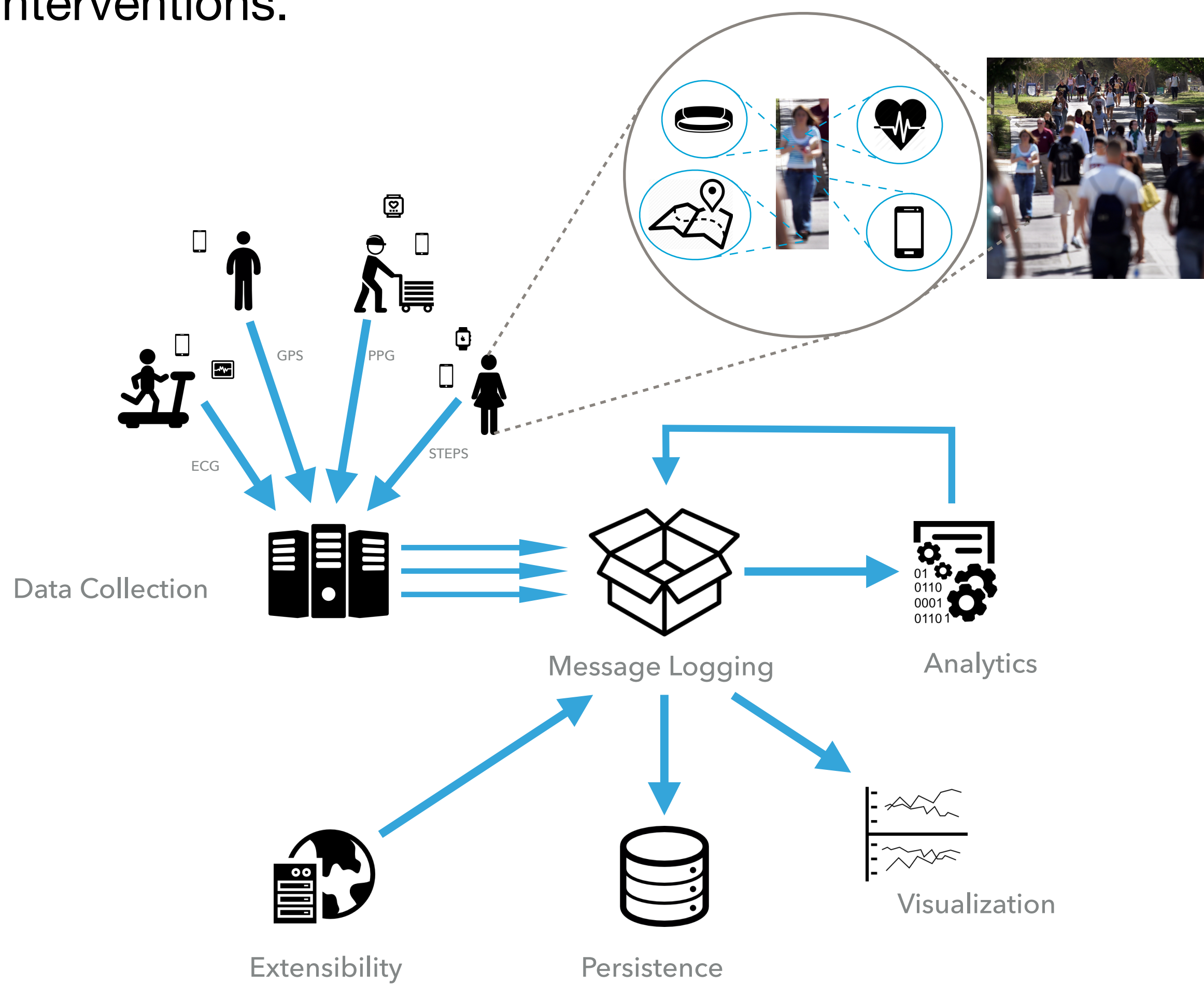




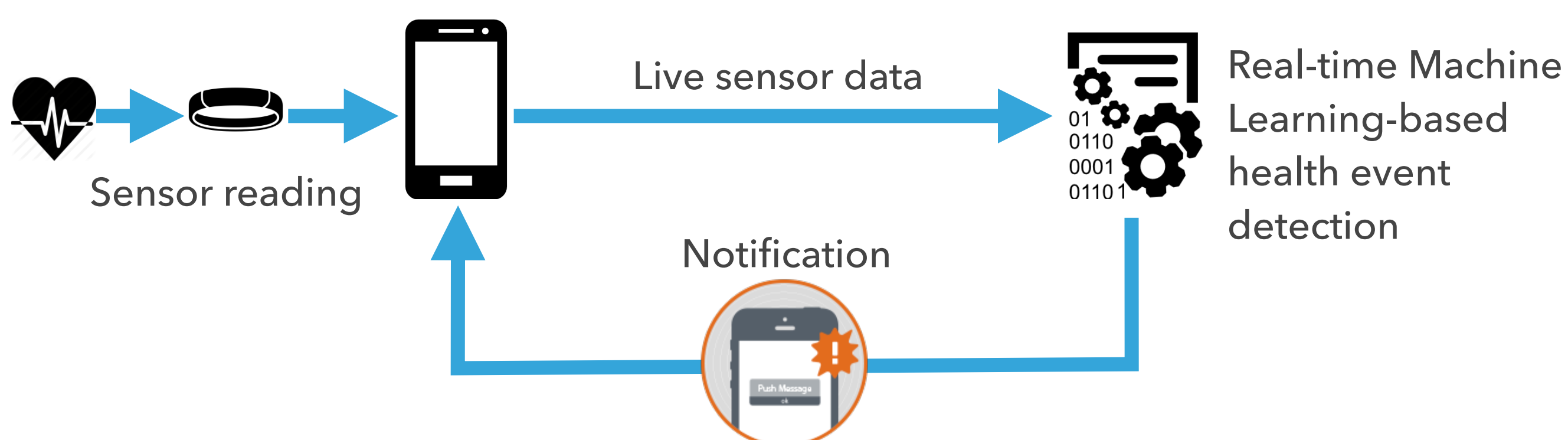
## UMass mHealthLab: Campus-scale Testbed for Real-time Wearable Sensing and Analytics



- **Deployment:** Ongoing deployment of campus-scale testbed with 500-1000 subjects with continuous data from wearables and mobile devices.
- **Platform:** Scalable platform for streaming data collection from wearable sensors, massively parallel logging, real-time analytics and visualization.
- **Scalability:** Support for thousands of users and devices, diverse machine learning analytics, real-time feedback and interventions.



- **Analytics:** Ingested data immediately available to Machine Learning libraries, live sensor visualizations and dashboards



Machine Learning-based analytics with real-time notifications and interventions

## Research Areas

### Machine Learning for Mobile Health

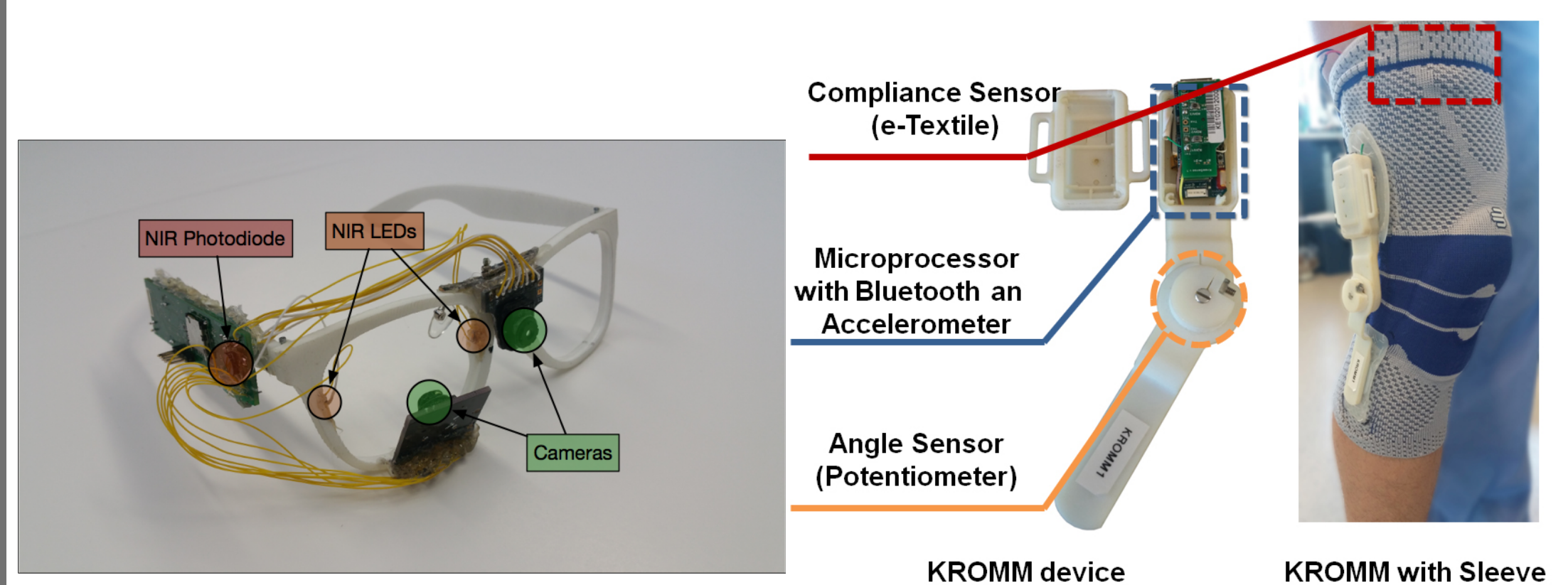
- **Sensor data analysis:** Wireless ECG morphology extraction using Conditional Random Fields (CRF) and CRF + Context Free Grammar (CRF-CFG) models
- **Multi-modal inference:** Leveraging diverse sensors on wearables and phones using Dynamic Bayesian Networks and CRFs to improve detection accuracy.
- **Ground truth label availability:** Training event detectors using multiple-instance (MI) learning and Active Learning methods.
- **Lab-to-Field generalizability:** Domain adaptation techniques to handle covariate shift, prior probability shift and label granularity shift.

### Wearable Sensing & Health Applications

- **Drug usage detection:** Real-time detection of cocaine use in the natural environment using chest worn ECG sensors.
- **Smoking and eating behaviors:** Detection of smoking/eating/drinking behaviors via wrist-worn sensors and hand-to-mouth actions.



- **Group dynamics sensing:** Understanding group dynamics via context sensing, bluetooth interactions and WiFi logs.
- **Fatigue detection:** Fatigue detection using custom-designed low-power computational eyeglasses
- **Context sensing:** Combining location, time-of-day, physiology (pulse, GSR, ECG, eye movements), behaviors (via hand-to-mouth gestures) for continuous assessment.
- **Neurological, Neuromuscular, and Muscular skeleton disorders:** Novel sensors and remote monitoring systems for stroke, Parkinsons and Osteoarthritis.



## MOSAIC: Research Interests and Capabilities

- Large-scale testbed for data collection, algorithm development, and field validation of MOSAIC.
- Scalable open-source platform and real-time machine learning analytics on multi-modal sensor streams; real-time interventions.



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